

Ulysses captures cataclysmic gamma-ray flare from shattered star

By DIANE AINSWORTH

The signal of a cataclysmic magnetic flare emanating from a star that cracked apart halfway across the galaxy has been captured by JPL's Ulysses spacecraft and is providing important clues about some of the most unusual stars in the universe.

The magnetic burst from the star SGR1900+14, located in the constellation Aquila 20,000 light-years away, was observed by Ulysses and other spacecraft with high-energy radiation detectors in space on Aug. 27, 1998, as its heavy metal crust fractured and released the most powerful wave of gamma radiation yet observed from this type of star.

"Soft gamma repeaters (SGRs) emit magnetic radiation sporadically, every few years, unlike gamma ray bursts, which explode and disappear," said Dr. Edward Smith, Ulysses project scientist at JPL. "This was the fourth soft gamma repeater to be observed, but unlike the others we have studied, this one emitted an exceedingly intense burst of radiation. We estimate that it released as much energy in a few

seconds as the Sun emits in 300 years." Ulysses is a joint mission of NASA and the European Space Agency.

SGR1900+14 is a newly discovered type of star called a "magnetar"—a dense ball of super-heavy matter about the size of a city, but weighing more than the Sun. Objects in this class have the greatest magnetic fields known in the universe. A magnetar is so intense that it powers a steady glow of X-rays from the star's surface, often punctuated by brief, intense gamma-ray flashes and, occasionally, by catastrophic flares like the one observed on Aug. 27. Astronomers think that all these effects are caused by an out-of-control magnetic field—one capable of heating, mixing and sometimes cracking the star's rigid surface.

Using several spacecraft detectors, including the Ulysses gamma ray burst instrument, scientists were able to measure this extremely rare event and pinpoint the precise source of the explosion with unprecedented clarity.

"The star, which has an extremely strong magnetic field, appears to have experienced a 'star quake' so powerful that it created a tem-

porary ionosphere on the night side of Earth and sent two spacecraft into protective safe modes," Smith said.

Data from the Ulysses experiment showed radiation counts that rocketed from background (near zero) levels to several thousand electrons per second. Dr. Kevin Hurley of UC Berkeley, who is principal investigator of the gamma ray burst experiment on Ulysses, reported that energy measurements were two times greater than any other recorded burst.

"The radiation, as seen by the gamma ray burst detector, spiked quickly and soon settled into a series of ever-smaller spikes that clearly revealed the neutron star's rotational period," Hurley reported at a NASA science press briefing on Sept. 29. "The star reminded us of a dying lighthouse. It kept rotating, but the lamp steadily faded away."

Hurley, who had been part of a team observing the star, recorded pulses or flashes of magnetic radiation emanating from the star every 5.16 seconds using another satellite, known as the Japanese/NASA Advanced Satellite for

See Ulysses, page 6

Deep Space 1 nearing final countdown

Although the launch date of the Deep Space 1 spacecraft will not be known for certain until Oct. 22, mission planners continue to prepare for launch on Oct. 24 from Cape Canaveral Air Station, Fla.

The launch window on Oct. 24 opens at 5 a.m. PDT and continues for 51 minutes.

The first launch of the New Millennium Program, Deep Space 1 will test 12 new technologies, including an ion propulsion engine evocative of rocket systems described in science fiction. □

Jupiter's 'white ovals' take Galileo scientists by storm

By JANE PLATT

As powerful hurricanes pummel coastal areas on Earth, NASA space scientists are studying similar giant, swirling storms on distant Jupiter that have combined to spawn a storm as large as Earth itself.

Three separate cold storms, called "white ovals" because of their color and egg shapes, have been observed in one band around Jupiter's mid-section for half a century. Two of the storms recently merged to form a larger white oval, according to scientists studying data from JPL's Galileo spacecraft, the Hubble Space Telescope and the agency's Infrared Telescope Facility atop Mauna Kea, Hawaii.

"The newly merged white oval is the

strongest storm in our solar system, with the exception of Jupiter's 200-year-old 'Great Red Spot' storm," said JPL senior research scientist Dr. Glenn Orton. "This may be the first time humans have ever observed such a large interaction between two storm systems."

Each of the white ovals that merged were about two-thirds the diameter of the Earth before the merger, when they combined to form a feature as large as Earth. Although scientists have observed the end result of the merger of the two white ovals, the actual "collision" took place under cover of darkness while Jupiter was turned away from view.

This new, powerful white oval has a myste-

See Galileo, page 4

Special Events Calendar

Ongoing

Alcoholics Anonymous—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. For more information, call Occupational Health Services at ext. 4-3319.

Codependents Anonymous—Meeting at noon every Wednesday. For more information, call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. For more information, call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the fourth Tuesday of the month at noon. For location, call Jayne Dutra at ext. 4-6400.

Senior Caregivers Support Group—Meets the second and fourth Wednesdays of the month at 6:30 p.m. at the Senior Care Network, 837 S. Fair Oaks Ave., Pasadena, conference room #1. For more information, call (626) 397-3110.

Wednesday, October 21

Chinese Language Class—Meeting at noon in Building 306-400.

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Hiking Club—Meeting at noon in Building 303-209.

“Making PDF Documents Work For You”—Chris Hawley, web developer, Section 389, will speak at noon in von Kármán Auditorium.

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

“The Search for Extraterrestrial Life: Lessons From the Earth”—Dr. Ken Nealson, lead scientist for JPL’s Astrobiology Research Element, will speak at 8 p.m. in Caltech’s Beckman Auditorium. Admission is free. For information, call (626) 395-4652.

Thursday, October 22

Caltech Architectural Tour—The Caltech Women’s Club presents this free service, which is open to the public. The tour begins at 11 a.m. and lasts about 1 1/2 hours. Meet at the Athenaeum front hall, 551 S. Hill, Pasadena. For information and reservations, call Susan Lee at (626) 395-6327.

Friday, October 23

JPL Dance Club—Meeting at noon in Building 300-217.

Sunday, October 25

Chamber Music—Karen Hwa-Chee Han will offer a program of traditional Chinese and American music, performed on Chinese bowed string instruments. Held in Caltech’s Dabney Lounge at 3:30 p.m. Admission is free. For information, call (626) 395-4652.

Tuesday, October 27

JPL Atari Club—Meeting at noon in Building 238-544.

Wednesday, October 28

Chinese Language Class—Meeting at noon in Building 306-400.

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. For more information, contact Mary Sue O’Brien at ext. 4-5090.

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

Thursday, October 29

JPL Golf Club—Meeting at noon in Building 306-302.

Friday, October 30

Just-In-Time (JIT) Product Fair—To be held from 10 a.m. to 2 p.m. in von Kármán Auditorium.

The Flying Karamazov Brothers—The troupe of juggles presents its latest production, *Sharps, Flats and Accidentals*, at 8 p.m. in Caltech’s Beckman Auditorium. Tickets are \$32, \$28 and \$24. For information, call (626) 395-4652.

Fri., Oct. 30-Sun., Nov. 1

“School For Husbands”—This Theater Arts at Caltech production featuring Caltech students, faculty and staff will be presented Friday and Saturday at 8 p.m.; Sunday at 3 p.m. Tickets are \$15.

United Way drive begins Oct. 30

Although JPL’s United Way campaign kicks off Friday, Oct. 30 with the Halloween Fashion Show, the spirit of giving in some Lab employees began to be demonstrated last month.

JPLers were among 150 people from local companies who donated time and effort to United Way’s “Day of Caring” Sept. 19.

The JPL volunteers joined others at the new Casa Maria on Washington Boulevard in Pasadena for yard and landscape improvement.

Casa Maria is planned as a transition/recovery home for women working toward self-improvement and self-reliance in order that they may regain custody of their children. Training for job, family, parenting and home skills will be provided at the United Way-supported facility, which is scheduled to open in spring 1999.

There will even be occasional provision for a resident’s child to live with his or her mother at Casa Maria, solidifying the training and transition efforts. The startup budget is being spent on necessary structural repairs, so no money was left to fix up the grounds. “The cleanup and beautification would not have been possible without the Day of Caring volunteers,” said Brenda Franklin of JPL’s United Way publicity sub-committee.

Information about JPL’s United Way campaign is scheduled to be distributed Oct. 29. The campaign, chaired this year by Human Resources Director Sue Henry, runs from Oct. 30 through Nov. 13.

The annual canned-food drive runs from Oct. 26 to Nov. 13. During 1997’s drive, JPL employees and contractors donated enough canned goods to feed 1,200 needy families.

Food donations may be put into barrels provided at the following locations:

- ERC (Building 114)
- Building 167 cafeteria
- Building 180 lobby
- Building 186
- Building 190 cafeteria
- Building 264 (repro)
- Building 301 second floor
- Building 303 cafeteria
- Building 525 main entrance
- Building 601 (Woodbury)

Suggested items for food donations include canned stew, soup, pork and beans, chili and dried foods such as pudding, cereal, coffee, flour and sugar.

See United Way, page 7

Benefits enrollment now underway through Oct. 30

The annual enrollment for JPL employee benefits takes place from Oct. 19 to 30. Employees may update dependent information, change medical or dental carriers or renew annual spending accounts at this time.

Benefits changes will be made through the telephone enrollment system, which will be open seven days a week, 24 hours a day during the enrollment period. All employees will have a personalized enrollment package mailed to their home.

Those participating in health care or dependent care spending accounts are required to enroll annually and must call the telephone enrollment system with their new 1999 contribution amount. Late enrollments are not permitted.

For more information, access the benefits web site at eis/hr/benefits/benefits.htm.

Health and dental plan representatives will be available Oct. 20 and 22 in the Building 167 cafeteria between 10 a.m. and 2 p.m. to answer questions. □

Mars Polar Lander arrives at KSC

By DIANE AINSWORTH

JPL's Mars Polar Lander arrived at Kennedy Space Center (KSC) in Florida on Oct. 1 to begin final preparations for its Jan. 3 launch.

The lander will be the second of two Mars spacecraft to be launched on Delta II vehicles this winter. It will follow Mars Climate Orbiter, scheduled for launch Dec. 10.

The spacecraft arrived aboard an Air Force C-17 cargo plane that landed at KSC's Shuttle Landing Facility following its flight from the Lockheed Martin Astronautics plant in Denver.

The spacecraft is designed to touch down on the Martian surface near the northernmost

boundary of the south pole. This is near the edge of Mars' thin sheet of carbon dioxide ice, which will have receded by the time the lander arrives in December 1999, late spring in the

southern hemisphere of Mars. The mission's objective is to study the water cycle at the Martian south pole. The lander also will help scientists learn more about climate change and current resources on Mars, studying frosts, dust, water vapor and condensates in the Martian atmosphere.

The Mars Polar Lander is to be readied for



KENNEDY SPACE CENTER PHOTO

In Kennedy Space Center's Spacecraft Assembly and Encapsulation Facility-2, the top of the Mars Polar Lander is removed for testing, which includes a functional test of the science instruments and the basic spacecraft subsystems.

launch in KSC's Spacecraft Assembly and Encapsulation Facility-2. Among the activities to be performed will be a functional test

See Lander, page 6

DSN pioneer Renzetti dies

Dr. Nicholas Renzetti, a telecommunications pioneer and major force behind the development of NASA's Deep Space Network (DSN), died in his sleep Oct. 7 at his San Marino home. He was 84.

Renzetti joined JPL in 1959 as manager of the DSN Engineering and Operations Section, less than a year after NASA was officially established and JPL transferred from the U.S. Army to the space agency.

In 1964, he began a 10-year position as tracking and data systems manager. He followed that by managing the Laboratory's telecommunications and data acquisition engineering, mission support and science offices. From 1994 to his retirement in 1996 he served as DSN science advisor.



Dr. Nicholas Renzetti

Renzetti, who received his doctorate from Columbia University in 1940, was credited with the DSN's initial systems engineering and development. Among his career highlights was his involvement in establishing the ground systems network for global positioning system (GPS) receivers, and the development of the Goldstone Solar System Radar as a science instrument rather than just as a tracking station.

Renzetti was remembered in an Oct. 12 JPL memorial gathering for his passion, enthusiasm and demand for excellence.

"Nick is recognized for helping make the DSN a scientific instrument of explicit precision and tremendous capability," said Deputy Director Larry Dumas.

Former telecommunications and mission operations director Paul Westmoreland recalled that Renzetti received "a great deal of respect for his tenacious advocacy for JPL programs."

Among the scores of Renzetti's technical papers, articles and contributions to other publications was his authorship of the story of the technological development of the DSN, published in the JPL Space Program Summaries and its successor journals.

Renzetti in his later years developed a photographic history of the DSN, which lives on in the fourth-floor hallway of Building 303 and is posted on the Internet.

Renzetti is survived by his wife, Judith; daughters Alexandra, Cassandra and Valentina; son Nicholas; and four grandchildren.

No services were held. □

New agreement augments Lab's science data systems support

By MARK WHALEN

JPL has selected Raytheon Company to provide supplemental support to the Laboratory's work in science data systems.

Raytheon's STX business unit will provide services to augment JPL's efforts in science data systems development, implementation and operations, said Moshe Pniel, technical manager of the recently signed contract.

The five-year, \$55-million contract, which includes two five-year options, defines six areas of support to be provided by Raytheon to JPL:

- Data system engineering and top-level architecture design;
- Product-generation software development;
- Operations system development;
- Data system operations;
- Routine science mission planning;

See Contract, page 5

Volcano flyby



Taller than three Mount Everests and about as wide as the entire Hawaiian Island chain, Mars' giant Olympus Mons volcano is shown as imaged by Mars Global Surveyor's camera on April 25, 1998. Other recently released MGS images are available on the Internet at <http://photojournal.jpl.nasa.gov>.

Program's purchase of flight computers saves \$3.2 million

By MARK WHALEN

NASA's "faster, better, cheaper" approach has been well-demonstrated by JPL's Flight Hardware Logistics Program (FHLP), as evidenced by the recent deliveries of the first of a consolidated procurement of 29 flight computers for upcoming JPL missions.

The procurement was arranged by FHLP, which estimates that the purchase of the hardware from Lockheed Martin Federal Systems will save JPL more than \$3.2 million while providing improved delivery times.

The Tropospheric Emission Spectrometer (TES) and Space Infrared Telescope Facility (SIRTF) projects are the first two of nine JPL missions to receive the lightweight flight computer.

"The consolidated procurement approach allows Lockheed Martin to obtain savings in the quantity procurement of long-lead-time parts and in the efficiencies associated with fabricating, testing and delivering all the computers in a continuous run," said Larry Wright, who manages the program office on Lab. "The approach allows JPL to obtain internal savings through use of a single contract technical manager during a shorter contractual period and by sharing common spares."

Valerie Thomas, who was the data and controls project element manager for TES when the first FHLP computer was delivered to that project, found the program to be "very efficient, because each project doesn't have to negotiate its own contract provisions, and the costs are spread among a number of projects." Thomas said the consolidated purchase allowed TES to save more than \$100,000. "It made me very happy and made my job a lot easier."

The RAD 6000 flight computer, a derivative of the model employed on last year's Mars Pathfinder mission, is the same as the one being

used on the Mars Climate Orbiter, Mars Polar Lander and Stardust, which launch this coming December, January and February, respectively. In addition to TES and SIRTF, it will serve the following additional JPL missions (in order of receipt):

- Microwave Limb Sounder (MLS)
- Microwave Instrument for the Rosetta Orbiter (MIRO)
- SeaWinds
- Genesis
- Galaxy Evolution Explorer (GALEX)
- Mars Surveyor '01
- Mars Surveyor '03

Each of the missions except for MIRO and GALEX will receive more than one of the flight computers. Multiple computers are required to support either multiple pieces of hardware or to provide redundant operation within a single piece of hardware.

Two will be held by FHLP to serve as spares if any repair is necessary. This contributes to overall cost savings for the Lab, as "each project normally would buy its own spare," Wright noted.

The lightweight flight computer, measuring about 23 centimeters wide, 17 centimeters high and 2 centimeters thick (9 by 6 by .9 inches), weighs in at about 1.2 kilograms (42 ounces). It runs 22 million instructions per second.

In addition to the cost savings, noted Lloyd Keith, deputy



JPL PHOTO LAB

Lloyd Keith and Valerie Thomas view one of the flight computers purchased in a consolidated procurement by the Flight Hardware Logistics Program.

Galileo

Continued from page 1

rious trait, according to Orton. "We can see it, along with the other white ovals, at visible light and some infrared wavelengths, but we cannot see the new white oval at certain infrared wavelengths that peer underneath the storm's upper cloud layers," Orton said. This might mean the storm is in a transition stage, undergoing a rebirth after the merging of the two storms.

"With mature white ovals, we can see the upwelling of winds in the center, which in turn leads to downwelling around it," Orton said. The new white oval has a very cold center at a temperature of -157 C (-251 F), about one degree colder than its surroundings. "Because of this, the oval may have generated a thick cloud system which obscures the downwelling," Orton said, which could explain the

new oval's "disappearing act" at some wavelengths.

Adding to the mystery is the fact that a nearby storm rotating in the opposite direction to the new white oval used to be warmer than its surrounding. "This probably means that the feature contained mostly downwelling winds," said Orton. However, Galileo's photopolarimeter radiometer instrument showed this feature had cooled down to temperatures that were about the same as its surroundings.

Orton suspects that this storm somehow lost power and is no longer spinning as fast or downwelling as strongly as a year ago. This storm was once positioned between the two smaller white ovals that merged, and Orton theorized that when this storm system lost power, it removed the buffering mechanism that kept the two original white ovals apart.

Orton and his colleague, Dr. Brendan Fisher, a Caltech postdoctoral fellow at JPL,

manager of the Avionic Equipment Section, with the abundance of the Laboratory's upcoming missions, "The program has also turned into a great utility for emergency sharing of these similar types of flight computers. Now, if there's damage to a computer that's close to flight, a project can likely borrow one from another project that can accommodate the time required to repair or replace the damaged unit."

The future bodes well for this type of multiple-purchase procurement, Wright said, noting that small deep-space transponders and power supplies for missions in the near future could be financed and delivered similarly.

"The X2000 Project has a request for proposal to develop the next generation flight computer," he said. "Once that gets invented, we expect that FHLP will deliver it subsequent project users."

"This program has been viewed as highly successful throughout the Laboratory," Keith said. "We've received very positive response from our customers and numerous queries from other NASA organizations." □

based their conclusions about the temperatures using data gathered by Galileo on July 20, 1998, during the spacecraft's 17th orbit of Jupiter and its moons. Although much data from the flyby of Europa in that time period was lost because of a problem with the spacecraft's gyroscope, Galileo's photopolarimeter radiometer gathered the new data on the white ovals before the anomaly occurred.

The photopolarimeter radiometer measures temperature profiles and energy balance of Jupiter's atmosphere, helping scientists study the huge planet's cloud characteristics and composition. Scientists believe that the bright, visible clouds of the white ovals are composed of ammonia.

New images captured by Galileo of lightning on Jupiter, an eclipse and aurora on Jupiter's fiery moon Io, and surface features on two other Jovian moons—Europa and Callisto—are available online at <http://photojournal.jpl.nasa.gov>. □

Lab experiment may help clear the air for astronauts

By MARK WHALEN

Several hours after Space Shuttle Discovery launches toward its eight-day, 22-hour mission on Oct. 29, a JPL payload will begin testing to help ensure the health and safety of astronauts for all future human space flight.

By identifying a wide range of organic and inorganic molecules in the air onboard the shuttle, a JPL-designed and constructed device called the Electronic Nose (E-Nose) could be critical to the detection of potentially harmful gases on long-duration missions, especially the future international space station.

"The STS-95 crew in particular and astronauts in general have expressed a lot of interest in E-Nose," said principal investigator Dr. Amy Ryan of JPL. "Until now, if astronauts smelled something unusual, they have had to take a sample of the air for analysis after the flight. We want to develop a device that is not just an alarm, but is able to identify a contaminant and its approximate concentration."

In the close confines of a spacecraft, the air that crew members breathe is filtered and recycled throughout the mission. Since the air supply is limited and very difficult to replace, the buildup of atmospheric contaminants is a concern to crew health. The accumulation of potentially harmful gases poses a more serious threat during long missions aboard a space station or



en route to distant bodies in the solar system.

If proven successful during STS-95, the device could be vital for future space crews in detecting chemical leaks, solvent spills and, particularly, electrical fires. The concern, Ryan said, is "there might be smoldering before someone smells it."

E-nose, which consists of an array of different polymeric thin film sensors, will be tested onboard Discovery for its ability to respond to compounds in the parts-per-million range.

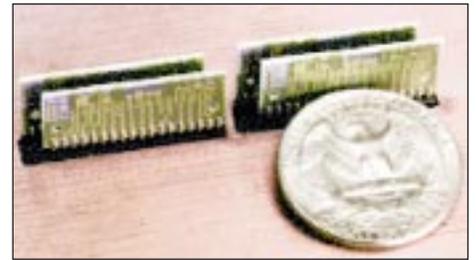
Among the 10 toxic compounds E-Nose is trained to sniff out in this experiment are methanol, ethanol, methane, ammonia, benzene and formaldehyde.

To be deployed below an air intake in the shuttle's mid-deck, the E-Nose developmental model—which weighs about 1.4 kilograms (three pounds)—will record data points every 15 seconds for storage on a palmtop computer. Once a day, shuttle commander Curt Brown will collect an independent air sample and an alcohol wipe will be applied to record a daily marker.

During this experimental phase, E-Nose data won't be analyzed in real-time, although that is its long-term goal. "We first want to ensure that the system doesn't produce any false alarms," Ryan said.

Following the STS-95 flight, E-Nose data analysis will be done at JPL by Ryan and co-workers Dr. Margie Homer and Dr. Hanying Zhou. Concurrently, Johnson Space Center will perform toxicology analysis on shuttle air samples taken daily to corroborate E-nose data.

Besides designing the instrument, JPL constructed the sensor assembly, performed most of the preflight testing and developed the pattern recognition software engine that is needed



Four substrates on E-Nose each contain eight sensors for detecting toxic compounds.

to deconvolute the recorded data.

The work has been done in collaboration with Dr. Nathan Lewis of Caltech. Early in the instrument's development, Dr. Martin Buehler of JPL made crucial contributions in the design of the device's electronics and its substrates, the ceramics on which the polymers are deposited.

Ryan and JPL Project Manager Dr. Dan Karmon noted that the E-Nose would be a useful system for many non-NASA applications. It could supplement the air quality monitoring of industrial processing, environmental toxins and pollutants, atmospheric composition for food quality assessments, and medical diagnoses, where the device might detect the metabolic products exuded from skin.

"Because of its size, the E-Nose can be used in many locations where larger, more cumbersome—and more expensive—monitors could not fit," Karmon said. "This is especially true on a space station or other spacecraft, where space is at a premium." A small, credit card-sized monitor is a definite possibility for the future, he added. "A device of this size could easily be carried by crew members on the international space station. It can also be networked over a large structure like a factory floor.

"This JPL effort is unique," Karmon added. "It is a NASA effort to test a 'fast insertion' approach to new technologies while doing it with very modest expenditures." □

Contract

Continued from page 3

- End-user support operations.

"This is a true example of JPL partnering with industry," said Pniel, who is also manager of JPL's Advanced Spaceborne Thermal Emission Reflectance Radiometer (ASTER) project. "Raytheon sees JPL as a long-term commitment, and our goal is to have Raytheon behave and act as a partner, to provide the Laboratory with access to new information technology, and to bring us new techniques, corporate knowledge and investment."

The contract with Raytheon STX will be administered by JPL's Space and Earth Science Programs Directorate. However, support will be available to any JPL program or mission.

Pniel said an anticipated 100 people will be working under the contract within three to five years.

Raytheon is expected by Thanks-giving to open a new facility in Pasadena to support its JPL work. The Euclid Street location is approximately six miles from JPL, and will

include a business development office and a facility for visiting scientists.

Raytheon staff will contribute as "Category X" contractors. Work will proceed on a task order basis as JPL issues individual contract work orders. Pniel said there are currently 17 such orders under proposal by Raytheon for JPL tasks.

"We've never had a software arrangement like this—an umbrella contract that's allowed us to work with all areas of science data systems," Pniel said.

Raytheon will contribute to JPL's new work already on the drawing board as well as missions that have not yet been proposed.

In fact, said contract negotiator Marty Scarbrough of the Acquisition Division, "We hope that eventually this will evolve into a relationship where Raytheon will actually assist JPL in getting and developing new work."

"For some of the work we don't know about yet, we anticipate that Raytheon will participate in segments of proposals," Pniel added.

Raytheon could opt to commercialize science data products they develop in the course of their work with JPL, Pniel said, "If they see a proposal with market-development potential."

The company could, for example, make changes to software algorithms that could help adapt it for commercial use.

"Raytheon understands that if they decide to use any software that was either developed by JPL or by Raytheon to do this work, they would need permission from Caltech," he added.

The Raytheon deal came about following a highly competitive procurement.

"There was a major response to the request for proposals from a number of top-notch American companies," Scarbrough said.

A unique aspect of the deal, she added, was the fact that this represented JPL's first Internet-based request for proposals.

The proposal was originally submitted online to 63 bidders, "and because of the large volume of complex documentation involved, contractors liked having electronic access," she said. "It proved to be a very successful way of moving information around."

Raytheon earlier this year signed a contract to perform similar science data systems work for NASA's Ames Research Center in Mountain View, Calif. □

News Briefs



Douglas Stetson

Douglas Stetson has been named the manager of the Solar System Exploration Program Office in the Space and Earth Sciences Program Directorate.

Stetson has held a variety of technical and managerial positions since he joined JPL in 1983. He spent about 10 years in the Mission Design Section, specializing in orbital mechanics and planetary

mission design and engineering. During that time, he served as the lead mission design engineer for the Cassini mission early in the project's history, and was the study lead for a large number of advanced planetary concept studies.

From 1992 to 1993 Stetson worked at NASA Headquarters in the agency's Solar System Exploration Division. Since returning to JPL he has been heavily involved in strategic and technology planning for JPL's solar system exploration program and has continued to work closely with the NASA Office of Space Science.

Stetson received a bachelor's degree in physics in 1981 and a master's degree in aeronautics and astronautics in 1983 from Stanford University. □

JPL employees are invited to nominate individuals or groups for NASA Honor Awards to be presented in 1999.

Nomination information is

available from division and section offices. Nominations should be submitted to the immediate administrative supervisor of the nominee, and they will be processed up through their respective line organization. The nominations will be reviewed and those selected will be forwarded to NASA for consideration.

Directorates' final recommendations can be submitted to the JPL awards board chair, **Kirk Dawson**, no later than Monday, Nov. 30.

System procedures for nominations can be found on the Institutional Environment navigator at [http:// dmie.jpl.nasa.gov](http://dmie.jpl.nasa.gov) under by searching for "NASA Honor Awards." □

Reservations are available at the ERC for a fundraiser to support the La Cañada Flintridge Tournament of Roses' "Martian Mischief" 1999 Rose Parade Float, which is based on the Sojourner rover. The wine-tasting event will be held Sunday, Nov. 1 at the La Cañada Flintridge Country Club. The cost is \$40.

For more information, call **Bob Ferber** at (818) 790-2013. □

JPL staff are invited to attend the annual Summer Undergraduate Research Fellowship (SURF) Seminar Day, Saturday, Oct. 17 at Caltech. The program is celebrating its 20th year.

The SURF program offers undergraduates the opportunity to do research projects in collaboration with Caltech faculty or JPL technical staff members over a 10-week period, mid-June to late August. A seminar series featuring JPL scientists is also offered as part of the SURF program.

Student presentations are from 10 to 11:40 a.m. and from 1 to 4 p.m., followed by a plenary session at 4:15 p.m. and reception at 5:30 p.m.

A complete schedule is available at <http://www.cco.caltech.edu/~surf>.

Reservations are not required for the student presentations or plenary session, but are required for a buffet luncheon at 11:45 a.m. in San Pasqual Mall. The cost is \$10.

For more information, contact the Student-Faculty Programs Office, (626) 395-2885, or e-mail to sfp@cco. □

Ulysses

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Cosmology and Astrophysics (ASCA). Comparisons of the ASCA data and measurements from other satellites showed that the X-ray pulses were gradually slowing down after the radiation burst subsided.

From its intensity and rotational slowing, scientists calculated that SGR1900+14 has a magnetic field about a thousand trillion times stronger than Earth's magnetic field and about one thousand times stronger than any found elsewhere in the universe, Smith said. During the flashing episode, Dr. Chryssa Kouveliotou of NASA's Marshall Space Flight Center in

Huntsville, Ala., who led another team observing the star with sensitive X-ray detectors aboard NASA's Rossi X-ray Timing Explorer satellite, found faint X-rays coming from the star, similar to what they had observed in another soft gamma repeater which turned out to be a magnetar.

Three of the four confirmed soft gamma repeaters—designated 1900+14, 1806-20 and 0526-66—have localized X-ray emissions; 1806-20 and 1900+14 have regular pulsations and 0526-66 had an eight-second period during its magnetic explosion observed in 1979. It is by comparing the change in the rotational period of these stars across several observations that scientists can measure their magnetic fields.

"Magnetars seem to answer several myster-

ies about the structure and evolution of stars," said Kouveliotou. "We think magnetars spend their first 10,000 years as soft gamma repeaters. As they weaken with age and slow their rotation, they become anomalous X-ray pulsars—stars that do not have enough 'juice' to flash anymore, but which emit a steady flow of X-rays for perhaps another 30,000 years. After that, they fade to black and drift for eternity through the heavens. The absence of observable pulsars in some supernova remnants just means that the pulsar's lights have gone out sooner than we expected."

Additional information on magnetars or the Aug. 27 burst is available on the Internet at <http://www1.msfc.nasa.gov/NEWSROOM/> and <http://www.magnetars.com/>. □

Lander

Continued from page 3

of the science instruments and the basic spacecraft subsystems. Checkout of the communications system will be performed, including a verification of the spacecraft's ability to send data to controllers on Earth via the Mars Climate Orbiter and the tracking stations of the Deep Space Network. The spacecraft's radar, used during the final descent, will be installed and the solar arrays will be attached and tested.

The Deep Space 2 microprobes will also be installed on the lander's cruise ring. These two probes, developed at JPL under the New Millennium Program, will test technology and instruments to search for water several feet below the Martian surface. The spacecraft will then be ready for mating with the cruise stage and parachutes used for the trip through the lower Martian atmosphere will then be installed.

Next, the spacecraft will be fueled with its attitude control fuel and undergo spin balance testing. Finally, on Dec. 15, the spacecraft will be mated to a Star 48 solid propellant upper

stage booster and then prepared for transportation to the launch pad.

The Mars Polar Lander with its upper stage booster will be transported to Complex 17 on Dec. 21 for hoisting atop the Delta and mating to the second stage. After the spacecraft undergoes a state-of-health check, it will be closed out for flight and on Dec. 29 the two halves of the Delta nose fairing placed around it.

At liftoff, the spacecraft weighs 567 kilograms (1,270 pounds), is 1.06 meter (3.6 feet) tall and 3.6 meters (12 feet) long. □

ISO pre-assessment audit coming up in November

By KERRY LYN CASSIDY
ISO 9001 Implementation Team

Beginning Nov. 16, a NASA-selected third-party registrar, Det Norske Veritas (DNV), will visit the Lab to conduct an audit over the span of a few days to assess the Lab's readiness for ISO 9001 certification. DNV is one of the leading providers of assessment and certification for quality and environmental systems worldwide.

ISO audits follow a pre-determined procedure. For example, they always start with the highest official on the site. They are done one-on-one in the presence of a JPL escort. Non-conformances—that is, places where processes do not follow the ISO standards reflected in the JPL policy requirements—will be identified during the audit. Findings of nonconformances will be reported by DNV. Corrective action notices will be assigned to the appropriate employees who will then follow the necessary process to correct nonconformances.

Managers have gained an overview of the corrective/preventive action process through their attendance in classes over the last two weeks. These classes for management will continue and eventually include a more detailed class involving root cause analysis and other aspects of the process.

To prepare for the upcoming audits, all employees should understand the purpose for maintaining a quality product delivery system. They need to know which processes and procedures apply to their particular job and know where to locate them. Employee notebooks are being created and the URLs and templates for determining this information will be downloadable from the ISO web page at <http://iso>. Employees and their group supervisors are responsible for compiling these notebooks.

The employee notebooks will contain the following information: ISO worksheets, work authorization memo (WAM), a process map pertaining to specific work area, training records,

URLs indicating the location of pertinent organizational charts, and URLs that indicate the location of process policies and procedures used to perform given tasks. These notebooks will be kept in hard copy in binders at employees' workstations. Eventually, notebooks will reside in shared online folders accessible by both employee and group supervisor.

In addition, employees need to be able to determine which policies and procedures are current. The most up-to-date version of any policy will be found in DMIE and can be found using the IE Navigator at <http://dmie>. □

Halloween fashion show on mall Oct. 30

JPL's annual Halloween fashion show will be held on the steps of Building 180 on Friday, Oct. 30 starting at 11:45 a.m. Each participant in full costume will receive a \$5 gift certificate for ERC merchandise.

Displays by community service agencies supported by United Way and a lunch special offered by cafeteria contractor Eurest will be featured.

The United Way canned food donation drive will begin the same day. □

United Way

Continued from page 2

Caltech's Family Night, held in association with the United Way drive, will be held Oct. 23 at 5 p.m. in Beckman Auditorium. This free event features a pasta dinner, balloon sculpture, face painting, a caricaturist and Disney's recent film "Mulan." Tickets are available free of charge at the ERC office through Oct. 20.

For more information, go online to <http://hr/unitedway>. □

Passings

Ivey Jackson Justice Jr., 64, former manager of the DSN Resources and Safety Office, died of a heart attack Sept. 18 at his Pasadena home.

Justice, who joined JPL in 1970, managed Office 901 from its inception in July 1994 to April 1995. He then worked in the Telecommunications and Mission Operations Directorate's Business Operations Office 910. He retired in 1997.

Justice is survived by his wife, Kathleen, daughter Shiobian Brannon and one grand-daughter.

Cremation services were held in Ireland. □

Stephen Kozak, 82, a retired senior engi-

neering assistant in Section 337, died of heart failure Sept. 19 at his home in Glendora.

Kozak worked at JPL from 1963–85. He is survived by his wife, Estelle; daughter Marcia Houser; sons Stephen, Ron and Ray; and sister Wanda.

Services were held at Riverside National Cemetery. □

Frederick Brodish, 66, a retired senior instrument specialist in Section 351, died of heart failure Oct. 1 at Kaiser Hospital in Panorama City.

Brodish joined the Lab in 1968 and retired in 1995. He is survived by his wife, Dorothy, four children and seven grandchildren.

Memorial services were held Oct. 5. □

LETTERS

Thank you to all my friends at JPL and in 665 for the lovely plant sent to me in sympathy for the loss of my sister. It is a kindness that is greatly appreciated at this hard time.

Virginia Glassett

□□□

My wife, Susan, and I wish to thank the ERC for the beautiful plant sent to us on the death of her mother, Elizabeth Taylor.

Bob and Susan Edelson

□□□

I would like to thank the Caltech Credit Union, my coworkers and members for all the cards, flowers, gifts and well wishes I received my last day of work. I will miss all of you but have many good memories to take with me into my retirement. Thank you all very much.

Arlyce J. Oien

□□□

Thank you, all who came to my party, those who couldn't make it, and all of you who took time to wish me well on my retirement. Thank you, Charmaine, Laura and Jan, for making the arrangements and setting up the food and drink. The party was a warm and generous event. I'm looking forward to trying out my new shotgun barrel, with interchangeable chokes (on clay birds).

Anthony Giandomenico

□□□

What a blast! Thanks to all the people who made my retirement party such a hilarious success. Who else's retirement has featured a cross-dresser and a stripper in Von Kármán Auditorium? Special thanks to the planning committee, the testimonial people, and the actors in the Managing Magnificence skit. And thanks to all the Martians and SESPD folks who signed pictures for me. I also appreciate all the people who came to say goodbye. For those who missed it, it was videotaped. You can all keep track of my post-JPL adventures at <http://www.managingcreativity.com>.

Donna Shirley

FOR SALE

AIR CONDITIONER, AC 4800 BTU, new 7/98, \$150; WASH-

ER/DRYER, Maytag, stacked, 3 yrs. old, new \$1,000, sell \$500/obo. 626/398-3954, eve., 909/607-3812 (d), Margo Malakoff. BABY/TODDLER ITEMS: colorful walk-in playhouse (\$75); toddler picnic table and bench set (\$25); baby stroller, reclines for sleeping (\$75); changing table/chest of drawers (\$50). 626/355-6573. BASEBALL CARDS, '87 Topps rack packs, 45 cards, \$10/ea., possible McGwire and other major stars, unopened packs of 15 each. 626/914-6083.

BED, black leather 6-ft. hide-a-bed from Jennifer Convertibles, good condition, \$120/obo. 626/445-3864.

BED FRAME, king size, never used, \$20/obo. 626/568-8298.

BED SET, Little Mermaid, twin comforter, sheets, pillowcases, and canopy, \$15. 626/798-0329.

BEDROOM FURNITURE, oak youth set; platform twin bed, bookcase headboard, desk w/hutch, lg. armoire, exc. cond., orig. \$4,500, sell \$1,500. 626/447-6423.

BEDSPREAD, double, tailored, quilted, eggshell color, brand new, never used, cost \$139, sell \$50/obo. 909/593-4046.

BICYCLE, Bianchi Limited; large frame, perfect condition, could use new tires, \$500. 805/255-8933, John.

BICYCLE, BMX, good condition, \$50. 952-8455.

BICYCLES: specialized 1991 Allez, 23-inch (58.4 cm) carbon fiber frame, Suntour 12-speed shifters, very light and stiff, choice of triathlon or standard drop bars, Look pedals, \$410 firm; Fuji 12 speed, medium size, good condition, aluminum wheels, Suntour shifters, \$100 firm. 626/794-0886, Ted.

CALLER I.D. UNIT, Pacific Bell, PA25, \$30. 310/618-8977.

CARPET, discount price. 909/984-7717.

CELL PHONE, Nokia model 2190, GSM digital, brand new sealed in the box, leather case, car and home charger, \$125/obo. 323/935-3432.

CHAIR, blue velvet occasional, vg cond., \$75; LAMP SHADES, 2 off-white pleated, exc. cond., \$20; LIGHT FIXTURES, recessed eyeball, \$15/ea. 626/798-2531.

COLLECTIBLES, Gone With The Wind plates (\$25 each) and Franklin Mint Dolls (\$100 to \$250); all have original boxes and certificates. 626/301-9965, lv. message or e-mail: millerX4@aol.com.

COMFORTERS, 1 king blue/yellow floral w/matching duster, shams, \$50; 1 queen cream/rose w/duster, \$40; both exc. cond. 626/798-2531.

COMPUTER, Mac PowerCenter Pro 210 with 4GB HD, 604e, 16x CD, 64 MB RAM, 4m video, ultrawide SCSI, 60 MHz bus, G3 upgradable, fast and powerful, sac. \$1,000. 323/258-8917.

CORNER GROUP SET, laminated, woodgrain (brown) for bdrm (i.e. corner desk, chair, cabinet w/drawer, 3-drawer dresser), perf. for spare bdrm. or teenager's rm, vg cond., \$125/obo. 626/337-7522.

DINING ROOM TABLE, elegant, 6' x 4'; 1" beveled leaded glass, with leaded glass and brass V-shaped pedestals; & 4 high-backed black chrome & brocade chairs; excellent condition; all for \$600/obo. 951-9635.

DINING ROOM TABLE, exquisite 6-foot long, 1" thick beveled glass table, glass V-shaped pedestals, with 4 high-backed black chrome & brocade chairs; perfect condition; all for \$525/obo. 249-4561.

DINING ROOM TABLE, round, mahogany, sits 8 with two extensions, almost new, comes with 6 matching chairs, \$700/obo. 626/568-8298.

DINING TABLE, Duncan Phyffe style, clever turn-top table, 4 chairs newly upholstered, \$300/obo. 626/301-9965, lv. message or e-mail: millerX4@aol.com.

DINING TABLE, 5' oval wooden, recently refinished natural top & cherry legs, \$50; ARMCHAIR: roomy, comfortable with gray/white stripe slipcover, \$90. 626/793-7771, Andy.

DOGS, miniature dachshunds, AKC, male and female, blk/tan, red, chocolate/red. 352-1991.

DRESSERS, two units, oak, 5 drawers each with top drawer lined with cedar, excellent condition, 36" w x 46.5" h x 17" d, \$150 each, both for \$250/obo. 626/568-8298.

EXERCISE BIKE, Voit CX 1200 Ergometer, exc. cond., hardly used, \$60/obo. 248-9561.

EXERCISE MACHINE, NordicTrack Achiever, w/Fitwatch, exc. cond., \$350. 805/255-5645.

EXERCISE MACHINE, Soloflex, exc. cond., \$300. 626/447-6423.

FURNISHINGS, misc: oak roll-top desk, oak dining table & chairs, oak bar/stools, tv console, grandfather clock, brass chandelier, small fridge, small freezer, ping pong table. 626/791-1266.

GRANDFATHER CLOCK, Howard Miller design, key-driven, 3-chime, w/moon dial, elm burl décor, new oiler kit & manual incl.,

Continued on page 8

\$800. 249-6071.

HAIR DRYER, professional, chair style, works well, \$35/obo. 956-1744.

HIDE-A-BED, Simmons queen size, excellent condition, brown tones, \$300; GUITAR, Yamaha 12-string, exc. condition, \$200; OBOE, Conn, exc.condition, \$200. 248-5274 or dshirley@earthlink.net.

MOVING SALE, upright freezer, \$100; washer, \$50; dryer, \$75; mtn. bikes, \$35; microwave, \$30; Baldwin upright piano, \$500. 626/794-3576.

NON-PROFIT SALE, Sat., Nov. 28, 10 a.m. - 2 p.m.; 100s of new or refurbished home electronic items at rock-bottom prices; Nintendo game systems, \$99; 700 popular game cartridges at low, low prices; TVs, TV/VCRs, microwaves, cordless phones, personal copiers and much more, all carry warranty; Frostig Center, 971 N. Altadena Dr., Pasadena, a private non-profit center educating children with learning disabilities.

PENDANT, diamond, .25 ct., white gold chain, appraised \$600, sell \$300; CHRISTMAS BELLS, Lladro, \$15/ea. 626/798-2531. REFRIGERATOR, apt. size, lg. capacity, frost free, 5 yrs. old, exc. cond., \$175; FIREPLACE ACCESSORIES: wrought iron/chrome pedestal w/brush, shovel, poker & stand, beautiful, never used, \$75. 249-4561.

SKI RACK ACCESSORY, Yakima "Buttdown 6," still in box, list \$99, sell \$60; Weber BBQ, \$20. 352-6778.

SURFBOARD, exc. condition, \$120. 626/577-5479, Jorge or jorgev@earthlink.net.

TELEPHONE ANSWERING MACHINE, General Electric, black, microcassette, voice time/day stamp, hardly used. 626/844-4383.

TICKETS, Scott Adams (Dilbert) live at the El Rey theatre, early October, 2 tickets at face value, \$60/each. 323/935-3432, Allan. TYPEWRITER, Sharp PA-3030I portable electronic., bi-directional print, lift-off correction, 20-character liquid crystal display, built-in spelling checker, user manual, plus more, good condition, \$45/obo. 626/564-8329.

WASHER/ELECTRIC DRYER, GE, like new, white, under 1 year old; set \$550/obo. 323/258-7977.

WINE RACK, rod iron, free standing, \$35. 626/798-0329.

WOODEN BLOCKS, children's Playskool, with storage trunk, \$20. 626/798-0329.

VEHICLES / ACCESSORIES

'95 BMW 318 ISA, white, exc. cond., auto, upgraded sound, 37K mi., LoJack, extended warranty, \$21,000. 562/695-5197.

CAR RAMPS, like new, extra heavy-duty, 10-ton rated, \$40; TIRES, Uniroyal Laredo, 30 x 9.50 XR15, for LT, lots of tread, 10/32, \$30/tire; all for \$80. 249-6071.

'90 CHEVY Lumina APV mini-van, loaded, only 54,400 miles, new brakes, newer tires, new battery, auto, PS, PW, PDL, A/C, 7 passenger seats, cruise control, cassette, tilt, exc. condition. \$7,199. 909/594-3935.

'84 DODGE D-50 pickup truck, vg cond., auto, 2.6 eng., tilt wheel, bedliner, shell, very clean, well maintained, 138K mi., just smogged, orig. owner, \$3,000/obo. 626/332-2682.

NOTICE TO ADVERTISERS

All housing and vehicle advertisements require that the qualifying person(s) placing the ad be listed as an owner on the ownership documents.

Universe

Editor

Mark Whalen

Photos

JPL Photo Lab

Universe is published every other Friday by the Public Affairs Office of the Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109.

Advertising is a free service offered only to JPL, Caltech and contractor employees, retirees and immediate families.

Ads must be submitted on ad cards, available at the ERC and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov. E-mail ads are limited to six lines.

Ads are due at 2 p.m. on the Monday after publication for the following issue.

To change an address, contact your section's administrative assistant, who can make the change through the HRS database. For JPL retirees and others, call Xerox Business Services at (626) 844-4102.

'96 FORD Contour, 33,000 mi., loaded, 5-speed, V6, tinted windows, blk. w/gray interior, exc. cond., \$12,000. 362-3358.

'89 HONDA Accord LX, 4-dr., 5-speed, full pwr., gold, new radiator, a/c, timing belt, brakes; runs smooth, 139k mi, \$3,000. 248-4637.

'85 HONDA Interceptor 500, red/blue on white, 23k miles, full faring; always garaged; pretty bike but needs some work, does not presently run, \$1,100/obo. 790-6922.

'85 HONDA Shadow 700cc, V-Twin, shaft drive, automatic valve adjustment, water-cooled, excellent tires, low maintenance, reliable, good condition, red and black, \$1,800. 626/794-0886, Ted. '77 HONDA Civic, new brakes, recent tune-up (major), new battery, needs smog & current license tags, as is, \$500. 249-6071.

'92 HYUNDAI Elantra, vg cond., 94K, 30 mpg, a/c, am/fm/cass., \$3,500/obo. 909/305-1029.

INSTRUMENT GAGES, Steward Warner stage III, all back lit, fits VW '62-'74, with housing, volts, amps, vacuum oil pressure and tach, \$175. 249-6071.

'90 JEEP Cherokee Laredo, auto, 4x4+, 4.0 liter v-twin engine; remote auto door locks; pwr. strng, win, ABS brakes; privacy glass; a/c; am/fm/cass. w/prem. sound; spec rims, new tires + full spare; complete tool pkg; exc. cond. \$8,500. 249-4561.

'88 KAWASAKI Ninja 600, 10.3K miles, accessories incl.: motor-cycle cover, leather tank cover, Arai helmet, kryptonite lock; clean, 2nd owner, must sell, \$2,250/obo. 323/223-5086 or page at 323/340-5850.

'97 MAZDA Protégé, dark blue w/tan interior, 41,000 mi., Mazda-maintained, \$10,500. 626/294-0426.

'90 MAZDA MPV minivan, air, V6, full power, new tires, runs great, 1 owner, \$4,300. 957-5382.

'87 MAZDA RX7, GXL model, full equip'd, leather int., Kenwood AM/FM/CD stereo, lo blu. bk., \$2,500/obo. 626/797-6824.

MERCEDES BENZ repair manuals for model 300D Turbo-Diesel; 1 for engine, 2 for chassis. 952-0052.

'86 MERCEDES BENZ 190E, auto, beige, leather, smog certified, vg cond., orig. owner, \$3,500. 790-3802, Bill.

'93 MERCURY Villager GS minivan, 73K miles, excellent condition, Michelin tires, \$9,900. 626/791-8849.

'83 NOMAD travel trailer, '93 interior, 24 ft., front lounge, slps. 4, SC, <1 yr. awning, air, microwave, TV ant, am/fm/cass., bath fan, equalize hitch incl., \$4,000, TR6276, 626/355-6891.

'83 SUBARU coupe, needs body work, runs well, \$350. 626/447-6423, after 6 p.m.

TRAILER DOLLY, Power Caster, 110V, model PC-2, \$250. 626/355-6891.

'95 VW Jetta III, black, 58k, 5 spd., A/C, moonroof, pwr. windows/locks, AM/FM/cass, cruise, ABS, alarm, more, exc. condition plus extd. warranty; going back to school, must sell, \$12,500/obo. 790-6922.

WANTED

APARTMENT for Ph.D. student visiting JPL for 8 mo.; max. \$650/mo. 626/792-1168.

CLARINET, used, reasonable price, or for rent, or for loan; we will take good care of your instrument. 626/357-9708 evens., Lynda.

MODEM, 33.6K or faster, with drivers for Pentium. 626/405-1971, Joe.

SIGNATURES of Pathfinder and Sojourner people who didn't yet sign Donna Shirley's Pathfinder poster, in Mars Exploration Office, 264-419.

SOUND CARD with drivers for Pentium, not more than 3 years old. 626/405-1971, Joe.

SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.

TOY pieces or sets, "K'nex" and "Brio Mec". 626/303-3016, Eilyn.

VANPOOL RIDERS, stops along the 118, off-site contractors welcome, vanpool # 20. Ext. 4-0307, Marilyn.

VANPOOL RIDERS, Long Beach/Lakewood, JPL vanpool #14, 6:45 a.m.-3:45 p.m., Ext. 3-2706, John.

VOLLEYBALL PLAYERS, coed, all levels of play, Tuesdays 8:00-10:00 at Eagle Rock High School, \$4/night. 956-1744, Barbara.

WELDING EQUIPMENT, used oxy-acetylene. 323/662-4089.

FREE

CLEAN FILL DIRT [mostly gravel-like], you haul; several cu yds., take as little or as much as you like; 3 blks. ESE of NY & Hill, Altadena. 798-5152.

DOG, Rottweiler/Doberman mix; female, 1 yr. old, spayed, current shots; house trained and knows basic commands; great with kids and cats; to good home. 626/351-0097.

ENGR BOOKS, engineering materials, design graphics & geometry; a little weathered. 626/798-0329.

FIREWOOD, already cut to length, you haul. 626/798-2925.

FUTON FRAME, converts from couch to bed, you pick up. 626/296-0313.

FUTON MATTRESS, queen, w/o frame, clean. 790-0801.

KNITTING MACHINE, Maruyama, brand new but 30 yrs. old; for fine yarn. 909/593-4046.

SKYLIGHT, 2 x 4 feet, frosted, double pane Plexiglas, used for 1 year. 352-6778.

LOST & FOUND

Found: Sterling silver earring with black onyx stone and silver detail work creating an impression suggestive of a peacock feather, found 1 Oct. in East parking lot near bus stop at row 10, owner should contact lost and found at ERC.

FOR RENT

EAGLE ROCK, hilltop home, art deco, 2 bd., 1 ba., + office/bonus w/separate ba., modern white w/wood floors, \$1,300. 213/254-5350.

EAST PASADENA, sm. rear studio house; new stove, refrig.; water, gardener pd.; new paint and refurbishment; no smoking; \$485. 626/791-8113.

HOLLYWOOD KNOLLS area, 1 bd. apt. in 7-unit bldg. (adjacent to Universal, Griffith Park, and Toluca Lake in Burbank); hillside community w/close fwy. access (~15 min./JPL); outside floor entr., newly remodeled, hardwood oak floors, new refrig., dishwasher, a/c-heavy pump, solar heated water incl., laundry rm. downstairs, parking; non-smoker. 626/798-3235.

LA CANADA house, 3 bd., 2 ba., living rm., dining rm., family rm., den, lg. fenced yd. w/patio & deck, basketball court, fruit trees, walk to JPL, water & gardener incl., \$2,000, 4532 Viro Rd. 790-8216.

LA CANADA house, 3 bd., 2 ba., furnished, gardener provided, nice area nr. JPL and schools, children and pets OK, \$1,975. 714/854-5240.

LA CRESCENTA condo, 2 bd., 2 ba., 10 min./JPL, great school. 890-5655 or 626/286-2880.

MONROVIA, share fully furn. condo, 2 bd., 1.75 ba., kitch. priv. incl. refrig., stove, dshwsh., wshr./dryr., cent. air/heat, \$400, util. pd. 626/357-5189.

PASADENA, 2 bd. + den/office, 3 ba. apt., cent. air/heat, sm. patio, laundry facil., \$1,100 + util. 626/351-9641.

PASADENA, 425 S. Oakland Ave, between Del Mar & California Blvd., close to JPL & Caltech, near bus stop, spacious, furnished, 1 bd., 1 ba., private patio, private off-street carport, on-site laundry, \$1,250. 626/797-3101.

PASADENA, fully furnished condo, loaded, gated bldg., 1115 Cordova East #121, lg. studio, lg. kitchen, 2 blocks to Caltech; non-smoker; no pets, \$675. 626/792-9053, Marilyn.

PASADENA house, 3 bd., 1 ba., lg. fenced yd., 2-car gar., frplc., laundry, spa, nr. JPL & Rose Bowl, \$1,250 + util. 626/794-3576.

PASADENA, newly remodeled Craftsman bungalow, 2 bd., 1 ba.; good residential area; hardwood floor in living room and dining room; water, trash and gardener provided; see to appreciate, \$1,200. 683-9935, eves.

PASADENA, 2-bd., 1 1/2-ba. townhouse-style apt., near PCC, built-in range & oven, central a/c, carpets, drapes, disposal, laundry, covered parking, \$725. 790-7062.

SUNLAND house, 4 + 2, quiet st., mtn. vw., lg. rooms, fireplace, hardwood floors, new tile, stained glass windows, lg. fenced yd., new tile and paint. 548-0588.

REAL ESTATE

EAGLE ROCK condo, 1 bd., 1 ba., 820 sq. ft., light and airy end unit w/1 common wall on quiet cul-de-sac, cent. a/h, built-in microwave, range, dishwasher, convenient to L.A., Glendale, Pasadena; \$87,500. 626/584-4188.

LAKE CO., N. Calif., 2 1/2 acre lot, in beautiful Kelseyville near Clear Lake, perfect site for a permanent or retirement home, 30 walnut trees, paved road, electricity, \$36,000. 626/337-7522.

PASADENA, spacious house, 3 bd. + den, 1-3/4 ba., detached 2-car garage, dead-end street, exc. for small kids, quiet & friendly neighborhood, walking dist. to lib, park & grocery, 10 min./JPL; next to Hastings Ranch. 790-9275.

VACATION RENTALS

BIG BEAR cabin, quiet area near village, 2 bd., sleeps 8, completely furnished, F/P, TV/VCR, \$75/night. 249-8515.

BIG BEAR CITY, near airport, 2-bd., 1-ba. cabin, nicely furnished, sleeps 8; fireplace, TV, full kitchen; \$100 cleaning deposit; \$50/nite weekdays, \$150/weekends. 909/982-2986.

BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc price from \$65/night. 909/599-5225.

BIG BEAR LAKEFRONT lux. townhouse, 2 decks, sleeps 6, tennis, pool, spa. 949/786-6548.

CAMBRIA, ocean front house, exc. view, sleeps up to 4, \$125/night for 2, \$175/per night for 4. 248-8853.

HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: \$95/nite/2, 12/15-4/14 rate: \$110/nite/2, \$10/nite/add'l person. 949/348-8047.

MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, sunny, quiet, full kitchen, TV/VCR, JPL disc. rates, walk to Canyon Lodge. 249-8088.

MAMMOTH condo, in Chamonix at lifts 7, 8, 16, 17; 2 bd., 2 ba., slps 6, fireplace w/wood, fully equip. elec. kitchen w/microwave & extras, TV, VCR, cable fm stereo, pool & sun area, outdoor Jacuzzi, sauna, game, rec., laundry rms., walk to Cyn. Lodge, shops, lifts, hiking; special midweek rates; summer rates through Oct. 249-8524.

OCEANSIDE, on the sand, charming 1 bd. + condo, panoramic view, walk to pier/marina, pool, spa, game rm., sleeps 4. 949/786-6548.

PACIFIC GROVE house, 3 bd., 2 ba., fp, cable TV/VCR, stereo/CD, well-eqpd. kitch. w/microwav., beaut. furn., close to golf, beaches, 17 Mile Dr., Aquarium, Cannery Row, JPL discount. 626/441-3265.

PALM SPRINGS condo, 1 bd., compl. furn., pool, spa, tennis, cable TV, VCR; carpets, paint, cooking utensils new; rent daily, weekly, weekends, monthly. 626/445-0884.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/ski lifts, gourm. kitch., bikes, sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, in/outdoor pools, hot tub and beach; tennis, 10 min./skiing, casinos/golf, 1 hr./wine country; \$995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; \$495/wk. low seas., + \$90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.